REMARKS

In response to the Office Action, Applicant respectfully requests the Examiner to reconsider the above-captioned application in view of the foregoing amendments and the following comments. Claims 1, 35, 36, and 37 have been amended by this paper, and Claims 2-34 remain unchanged by this Amendment. Claim 38 has been added. Hence, by this paper, Claims 1-38 are presented for further examination.

I. Rejection of Claims 1-5, 11, 12, 16, 19-23, and 30-37 Under 35 U.S.C. § 103(a)

In paragraph 6 of the Office Action, the Examiner rejected Claims 1-5, 11, 12, 16, 19-23, 30, and 30-37 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,577,253 to Blickstein ("*Blickstein*") in view of view of Balasa, et al., Transformation of Nested Loops with Modulo Indexing to Affine Recurrences, Parallelization Techniques for Uniform Algorithms, 1-12, (World Scientific Pub., 1994) ("*Balasa*"). The Examiner took the position that *Blickstein* teaches all elements of Claim 1 except that *Blickstein* "doesn't explicitly disclose that the address computation code or one of the address expressions has nonlinear operations." *Office Action* at page 4. Rather, the Examiner argued that *Balasa* "in an analogous environment, discloses the address expression is nonlinear (p.2 lines 5-7, 'The most important practical subclass of the non-linear extensions consist of modulo expressions of affine indexing functions)." *Id.* For the reasons set forth below, Applicant respectfully disagrees with the Examiner's findings and determination that Claims 1-5, 11, 12, 16, 19-23, and 30-37 are unpatentable over *Blickstein* in view of *Balasa*.

A. Law of Obviousness

To establish a *prima facie* case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation to combine the reference teachings, (2) there must be a reasonable expectation of success, and (3) the references when combined must teach or suggest all of the claim limitations. *See M.P.E.P. § 2143.* It is well settled that "a showing of a suggestion, teaching or motivation to combine the prior art references is an 'essential component of an obviousness holding'." *See, e.g., Brown & Williamson Tobacco Corp. v. Philip Morris Inc., 229 F.3d 1120, 1124-25, 56 U.S.P.Q.2d 1456, 1459 (Fed. Cir. 2000).* The Examiner can satisfy the burden of showing obviousness of the combination "only by showing some objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art would

lead that individual to combine the relevant teachings of the references." *In re Fitch, 972 F.2d 1260, 1265, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992).* "Determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention." *ATD Corp. v. Lydall, Inc., 159 F.3d 534, 546 (Fed. Cir. 1998).*

B. *Blickstein* and *Balasa* Fail to Teach All Claim Limitations of Claim 1

To establish a *prima facie* case of obviousness, the Examiner must show that the prior art references teach or suggest all claim limitations. See M.P.E.P. § 2142. Applicant respectfully submits that neither *Blickstein* nor *Balasa* teach or suggest all limitations of Claim 1. As noted by the Examiner, *Blickstein* fails to disclose a method comprising "transforming the first source-level code into a second source-level code [] wherein the execution time of the second source-level code is less than the execution time of the first source-level code" as recited by Claim 1, as amended (emphasis added).

On page 4 of the Office Action, the Examiner states that *Blickstein* fails to disclose " that the address computation code or one of the address expressions has nonlinear operations." Rather, the Examiner states that *Balasa* "in an analogous environment," discloses "the address expression is non-linear." However, Applicant submits that *Balasa* operates in a non-analogous environment and fails to cure the defect of *Blickstein*. *Balasa* discloses that the use of transformation techniques, such as disclosed in *Balasa* "influence memory implementation costs." *Balasa* at 1. Further, *Balasa* states that the "result of these transformations can be used to increase the application domain of, for instance, control flow optimization techniques that are based on affine by statement models." *Balasa* at 11. Thus, Applicant submits that nowhere does *Balasa* disclose "transforming the first source-level code into a second source-level code [] wherein the second source-level code has fewer nonlinear operations than the first source-level code [] and wherein the execution time of the second source-level code is less than the execution time of the first source-level code," as recited by Claim 1, as amended. In particular, *Balasa* discloses a transformation technique that results in division operations being introduced into inner loop boundary calculations. *Balasa* at 11 (showing an exemplary "final solution"). Applicant submits by introducing non-linear, time consuming, operations into the transformed code indicates that *Balasa* does not teach or suggest, either expressly or inherently, "transforming the first source-level code into a second source-level code [] wherein the second source-level

code has fewer nonlinear operations than the first source-level code and [] wherein the execution time of the second source-level code is less than the execution time of the first source-level code, as recited by Claim 1, as amended, because the introduction of the non-linear division operation can increase the execution time on a particular electronic device. Thus, Applicant submits that the *Balasa* fails to cure the defect of *Blickstein* because even if the two techniques were combined, the resulting combination would still fail to transform "the first source-level code into a second source-level code [] wherein the second source-level code has fewer nonlinear operations than the first source-level code and [] wherein the execution time of the second source-level code is less than the execution time of the first source-level code, as recited by Claim 1, as amended. Thus, Applicant submits that neither *Blickstein* nor *Balasa*, alone, or in combination, teach or suggest all limitations of Claim 1.

C. *Blickstein* and *Balasa* Fail to Teach All Claim Limitations of Claim 38

Applicant respectfully submits that neither *Blickstein* nor *Balasa* teach or suggest all limitations of Claim 38. As noted by the Examiner, *Blickstein* fails to disclose a method comprising "inputting a first source-level code that describes the functionality of the application, the first source-level code comprising address computation code and a plurality of arrays with address expressions, wherein the address computation code or one of the address expressions has nonlinear operations," as recited by Claim 38 (emphasis added).

The Examiner takes the position that *Balasa* "discloses [that] the address expression is nonlinear." *Balasa* discloses a mathematical framework whereby a loop is transformed by defining a Diophantine system and obtaining the Hermite normal form of the system. *See Balasa* at 2-4. Thus, *Balasa* discloses a method that operates on different principles than the method of *Blickstein*. In particular, in *Balasa*, the method "is targeted towards transformations for specifications with fixed algorithm parameters." *Balasa* at 2 (emphasis added). For example, the method of *Balasa* operates on loops that have boundary values for the loop iterators that are known at compile time. *Balasa* at 3 and footnote 1. This is shown in the illustrative example on page 10 of *Balasa* in which each of the loop boundaries are each constant numeric values. However, Claim 1, as amended, recites a method "wherein at least one of the address expressions includes a variable having a value that is in a range of values, the range being determined at runtime." Because *Balasa* fails to teach a method of transforming source code "wherein at least one of the address expressions includes a variable having a value that is in a range of values, the

range being determined at runtime," Applicant submits that the combination of *Blickstein* and *Balasa* fails to disclose all elements of Claim 38.

D. *Blickstein* and *Balasa* Fail to Teach All Claim Limitations of Claim 35, and 36

Claims 35 and 36,as amended, include the limitations of Claim 31. In rejecting that claim, the Examiner indicated that *Blickstein* does not "explicitly disclose that the address expression is piece wise linear." *Office Action at 10.* Rather, the Examiner argues that *Balasa* discloses "that the address expression is piece wise linear." *Id.* However, Claim 36, as amended, recites "the optimizing system transforms the first source-level code by performing a linear induction analysis step on at least one piece wise linear address expression and wherein performing the induction analysis step comprises replacing the address expression with single pointer arithmetic and a single conditional." Applicant submits that the Examiner has improperly pieced together the pieces of prior art. More precisely, the Examiner has indicated that *Blickstein* does not disclose transforming at least one piece wise linear address expression. Applicant submits that *Balasa* fails to cure this defect of *Blickstein.* In particular, Applicant submit that nowhere does *Balasa* disclose a method of transforming code that comprises "replacing the address expression with single pointer arithmetic and a single conditional" because the disclosed technique of *Balasa* merely transforms the loop indices in an address expression into a different set of loops and linear address expressiosn. *See Balasa* at 11 (example). *Balasa* fails to disclose replacing the piece wise linear function with either "single pointer arithmetic" or a "single conditional." Thus, Applicant submits that *Blickstein* and *Balasa*, either alone, or in combination, fail to teach or suggest all limitations of Claim 36.

Because Claim 35 recites at least some of the patentable features discussed with respect to Claim 36, Applicant submits that Claim 35 is also patentable for at least the same reasons.

E. No Motivation to Combine *Blickstein* and *Balasa* is Shown

Furthermore, Applicant submits that the Examiner failed to establish a motivation to combine *Blickstein* and *Balasa.* The Examiner stated "the modification would have been obvious because one of ordinary skill in the art would want to utilize the teachings of Balasa to optimize nonlinear expressions because they are a very important class of expressions for the multi-dimensional signal and data processing field." *Office Action* at 4. *Balasa* indicates that its disclosure is directed to "multi-dimensional (M-D) signal and data processing systems." *Balasa* at 1. The Examiner appears to refer, in particular, to the portion of *Balasa* that states that "[t]he

most important practical subclass of the non-linear extensions consist of *modulo expressions of affine indexing functions*." *Balasa* at 2 (emphasis in original). However, this statement only indicates that modulo is an important class of "non-linear extensions" not that optimizing nonlinear expressions is important. Further, nowhere does *Blickstein* indicate that it is related to the field of "multi-dimensional signal and data processing systems" that is identified by *Balasa*. Thus, the Examiner failed to identify any relationship between the methods of the two references such that one of skill in the art would recognize any motivation or suggestion to combine these references. Thus, the Examiner has failed to identify any motivation or suggestion in the prior art to combine *Blickstein* and *Balasa*.

Further, *Balasa* discloses a mathematical framework whereby a loop is transformed by defining a Diophantine system and obtaining the Hermite normal form of the system. *See Balasa* at 2-4. Thus, *Balasa* discloses a method that operates on different principles than the inductive variable identification method of *Blickstein*. The Examiner failed to provide any suggestion or motivation in the prior art that such a combination of the incompatible methods of *Balasa* and *Blickstein* would be advantageous. Thus, Applicant submits that the Examiner's rejection is based on an improper "hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention." *See ATD Corp. v. Lydall, Inc., 159 F.3d 534, 546 (Fed. Cir. 1998)*. For each of the reasons discussed above, Applicant submits that the Examiner has failed to establish a motivation to combine.

Thus, Applicant submits that the proposed combination of *Blickstein* with *Balasa* is not sufficient to render Claim 38 *prima facie* obvious because *Blickstein* and *Balasa* fail to teach or suggest all elements of Claim 38, and because the Examiner has not established a motivation to combine. Applicant therefore submits that Claim 38 defines patentable subject matter over *Blickstein* and *Balasa*.

Since Claim 37 recites at least some of the patentable features discussed in connection with Claims 1, 36, and 38 above, the Applicant submits that *Blickstein* and *Balasa* also neither anticipate nor would have made obvious the invention recited in Claim 38 for at least the same reasons. Applicant respectfully submits that Claims 1 and 35-38 are allowable. The Applicant therefore requests that the rejection of Claims 1 and 35-37 be withdrawn. Since each of Claims 2-5, 11, 12, 16, 19-23, and 30-34 depends either directly or indirectly from Claim 1, the Applicant submits that those claims are also allowable.

II. Rejection of Claims 6, 7-10, 13-15, 17, 18, and 24-29 Under 35 U.S.C. § 103(a)

In paragraph 7 of the Office Action, the Examiner rejected each of Claims 6, 13-15, 17, and 18 under 35 U.S.C. 103(a) as being unpatentable over *Blickstein* in view of *Balasa* in further view of Janssen, et al., A Specification Invariant Technique for Regularity Improvement between Flow-Graph Clusters, 138-143 (I.E.E.E. 1996) ("*Janssen*"). In paragraph 8 of the Office Action, the Examiner rejected each of Claims 7-9 under 35 U.S.C. 103(a) as being unpatentable over *Blickstein* in view of *Balasa* in further view of *Janssen* and in further view of Hong, et al., Throughput Optimization of General Non-Linear Computations, 406-499 (I.E.E.E. 1999) ("*Hong*"). In paragraph 9 of the Office Action, the Examiner rejected Claim 10 under 35 U.S.C. 103(a) as being unpatentable over *Blickstein* in view of *Balasa* in further view of *Janssen* and in further view of *Miranda, et al.*, ADOPT: Efficient Hardware Address Generation in Distributed Memory Architectures, 20-25 (I.E.E.E. 1996) ("*Miranda*"). In paragraph 10 of the Office Action, the Examiner rejected each of Claims 24-29 under 35 U.S.C. 103(a) as being unpatentable over *Blickstein* in view of *Balasa* in further view of U.S. Patent No. 5,692,169 to Kathail, et al ("*Kathail*"). For the reasons set forth below, Applicant respectfully disagrees with the Examiner's findings and determination that Claims 6, 7-10, 13-15, 17, 18, and 24-29 are rendered obvious by *Blickstein* in view of any of *Janssen*, *Hong*, *Miranda*, *Kathail*, or *Balasa.*

Each of Claims 6, 7-10, 13-15, 17, 18, and 24-29 depend from independent Claim 1. Thus, Applicant respectfully submits that each of Claims 6, 7-10, 13-15, 17, 18, and 24-29 recite patentable subject matter for, at least, the reasons discussed above with respect to Claim 1. Applicant therefore submits that Claims 6, 7-10, 13-15, 17, 18, and 24-29 are each allowable.

III. Conclusion

Applicant has endeavored to address all of the Examiner's concerns as expressed in the outstanding Office Action. Accordingly, amendments to the claims for patentability purposes, the reasons therefore, and arguments in support of the patentability of the pending claim set are presented above. Any claim amendments which are not specifically discussed in the above remarks are not made for patentability purposes, and the claims would satisfy the statutory requirements for patentability without the entry of such amendments. In addition, such amendments do not narrow the scope of the claims. Rather, these amendments have only been

made to increase claim readability, to improve grammar, and to reduce the time and effort required of those in the art to clearly understand the scope of the claim language.

In light of the above amendments and remarks, reconsideration and withdrawal of the outstanding rejections is specifically requested. If the Examiner has any questions which may be answered by telephone, he is invited to call the undersigned directly. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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